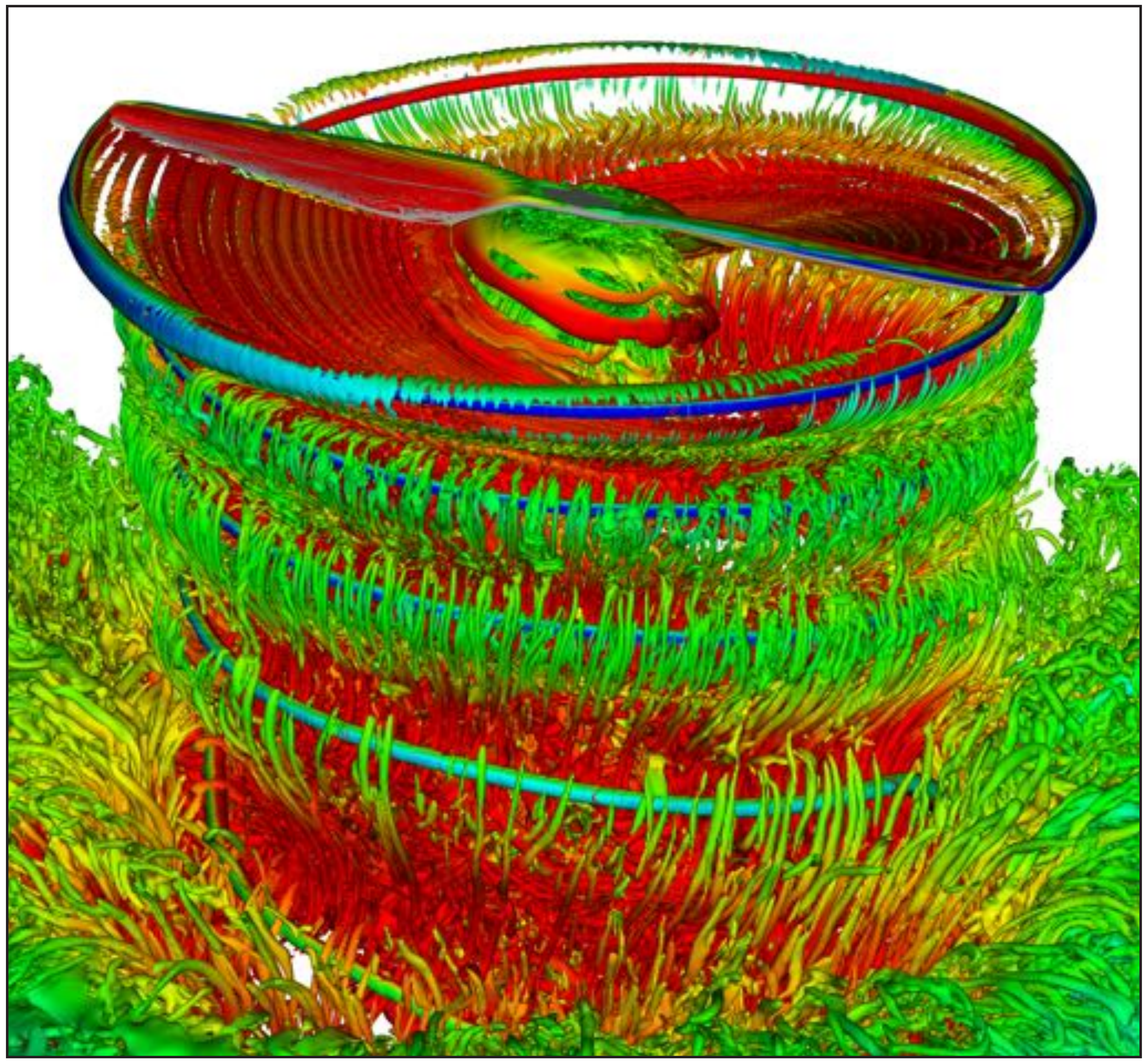
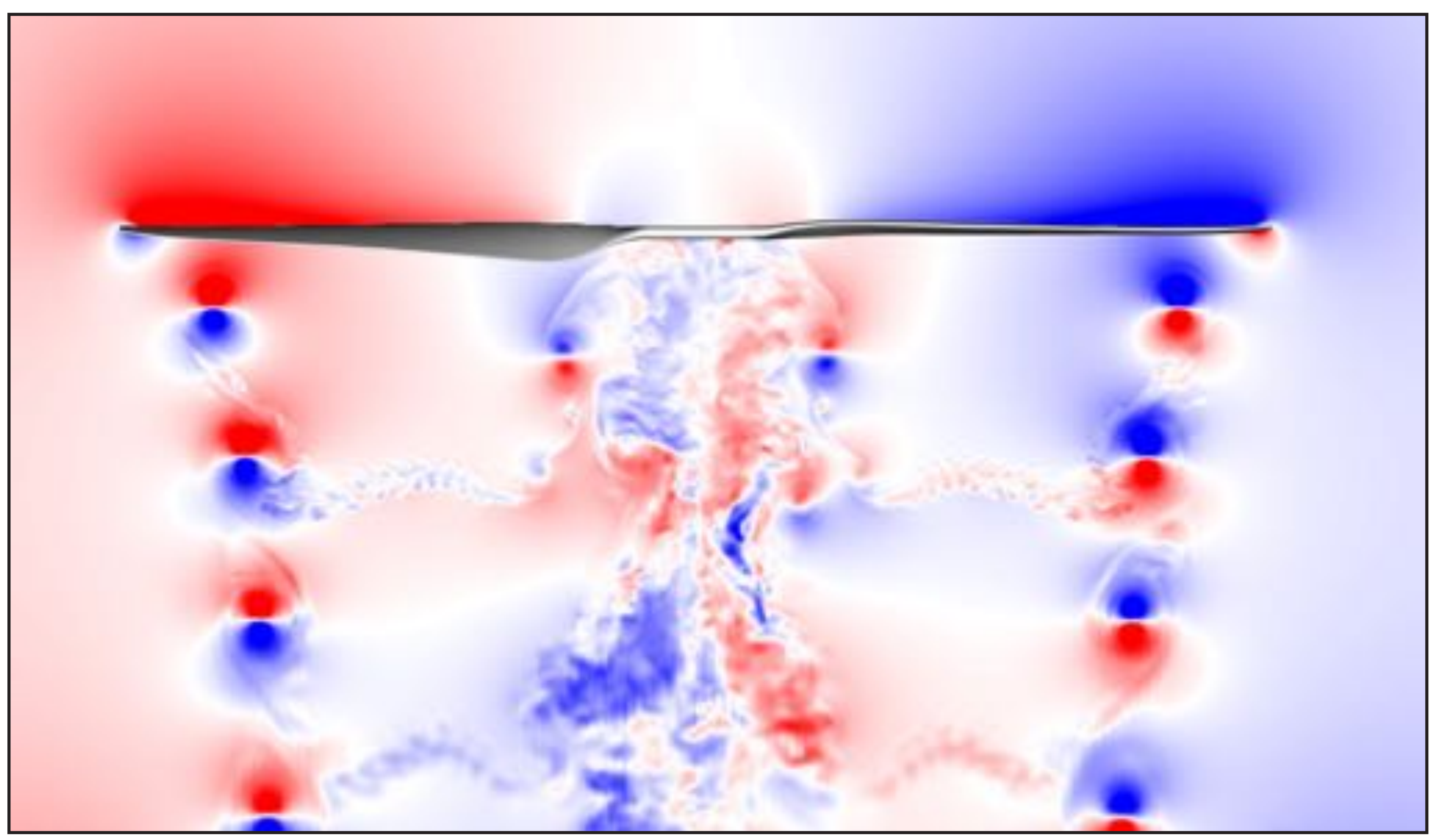


Instantaneous snapshot of turbulent structures on an isolated single rotor in hover, simulated using the Lattice Boltzmann method. The image shows the isosurface contour plot of Q-criterion, colored by vertical velocity, on a Cartesian mesh with 11 levels of refinement and a 5% tip chord resolution. *Michael Barad, Gerrit-Daniel Stich, Joseph Kocheemoolayil, NASA/Ames*



In this simulation, horizontal velocity is shown in a plane through the rotor axis (red is high, blue is low). A tip chord resolution of 5% with 11 levels of mesh refinement were used. *Gerrit-Daniel Stich, Joseph Kocheemoolayil, NASA/Ames*

National Aeronautics and
Space Administration

Lattice Boltzmann Simulations for Analyzing UAM Vehicle Propeller Noise

As urban air mobility (UAM) technology develops, the market for vertical take-off and landing vehicles—including autonomous urban air taxis and drones for applications such as package delivery, imaging, and surveillance—is growing rapidly. While electrification of the propulsion system and complete autonomy for operational efficiency are key pacing items, noise is the biggest roadblock to community acceptance and widespread adoption. The Lattice Boltzmann solver within NASA's Launch Ascent and Vehicle Aerodynamics (LAVA) framework is being used to predict the aerodynamic noise generated by a small isolated drone propeller in hover derived from first principles. The solver's efficiency is key to making it possible to routinely conduct first-principles aeroacoustic analysis of urban air taxis and drones.

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